

# PATENT COOPERATION TREATY

# PCT


## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 12 DEC 2005

PCT

Applicant's or agent's file reference MA 7798-01WO		<b>FOR FURTHER ACTION</b>		See Form PCT/IPEA/416
International application No. PCT/JP2004/013281		International filing date (day/month/year) 07.09.2004	Priority date (day/month/year) 08.09.2003	
International Patent Classification (IPC) or national classification and IPC H01L21/68, H01L21/52, H01L21/78, B23Q11/00, B23D59/00, H05K13/04				
Applicant MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al.				
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 6 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input checked="" type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>				
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>				
Date of submission of the demand  08.07.2005		Date of completion of this report  09.12.2005		
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer  Angermeier, D  Telephone No. +49 89 2399-2283		



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/JP2004/013281

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-44 as originally filed

**Claims, Numbers**

1-19 received on 08.07.2005 with letter of 07.07.2005

**Drawings, Sheets**

1/7-7/7 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☒ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☒ the claims, Nos. 17-19
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/JP2004/013281

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-16
	No: Claims	
Inventive step (IS)	Yes: Claims	1-16
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-16
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Box No. VII Certain defects in the international application**

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The following defects in the form or contents of the international application have been noted:

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item I.**

- 1.0 The amendments filed with the letter dated on July 7, 2005 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendments concerned are the following:

Newly filed dependent claims 17-19 do not have any basis in the originally filed application in particular in connection with claims 1 and 12 being referred to.

Consequently, claims 17-19 do not fulfill the requirements of Article 34(2)(b) PCT.

**Re Item V.**

- 1.0 The following documents are referred to in this communication:

D1 : US 4 778 326 A (ALTHOUSE ET AL) 18 October 1988 (1988-10-18)  
D2 : US 4 921 564 A (MOORE ET AL) 1 May 1990 (1990-05-01)  
D3 : PATENT ABSTRACTS OF JAPAN vol. 2000, no. 10, 17 November 2000  
(2000-11-17) -&; JP 2000 195877 A (RICOH CO LTD), 14 July 2000 (2000-07-14)

- 2.0 The current application does meet the requirements of Article 33(2) PCT, since the subject-matter of claims 1 and 12 is new.
- 2.1 The present application discloses an apparatus for removing semiconductor chip in which one out of a plurality of semiconductor chips formed from a diced semiconductor wafer is removed from a pressure sensitive sheet which holds the wafer by adhering thereto, a removing member having a plurality of protruding portions for coming into contact with a bottom surface of the semiconductor chip through the adhesive sheet and a plurality of suction hole portions formed in the recess portions for sucking the adhesive sheet fro the semiconductor chip at suction portions, a holding portion for sucking and holding the adhesive sheet around the removing member, and a removing member moving device for moving the removing member along the

bottom surface of the semiconductor chip so as to vary contact positions of the adhesive sheet with the respective protruding portions and the suction portions of the adhesive sheet through the respective suction hole portions, wherein in a state that a bottom surface of the adhesive sheet is sucked and held by the holding portion and the adhesive sheet is sucked through the respective suction hole portions so as to be partially removed.

The closest prior-art D1 shows a method and an apparatus for removing of chips from a flat flexible film by conventional techniques (cf. Figures 3-4 and column 3, line 9 -column 7, line 2).

Document D1 differs from the subject-matter of claims 1 and 12 in that of moving the removing member along the bottom surface of the semiconductor chip to the holding portion in a condition that the first contact surface is located at a almost same height of the second contact surface.

Consequently, the subject-matter of claims 1 and 12 is new in the sense of Article 33(2) PCT.

The problem to be solved by the present invention may therefore be regarded as that of facilitating reliable and efficient removal of the adhesive sheet from the bottom surface of the semiconductor chip.

However, none of the prior art documents cited in the ISR or in application proposes to the skilled person the feature of moving the removing member along the bottom surface of the semiconductor chip. It is therefore for the skilled person not an obvious design option to include this feature in the apparatus and method of document D1 without resort to any inventive skills.

Hence, the subject-matter of claims 1 and 12 is inventive in the sense of Article 33(3) PCT.

- 2.2 Claims 2-11 and 13-16 are respectively dependent on claim 1 and 12 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**Re Item VII.**

- 1) To meet the requirements of Rule 5.1(a)(ii) PCT, the documents D1-D3 should have been identified in the description and their relevant contents should have been indicated. The applicant should have ensured that it is clear from the description which features of the subject-matter of the independent claim(s) were known from these documents.
- 2) Independent claim 1 was not in the two-part form in accordance with Rule 6.3(b) PCT.

**Re Item VIII.**

- 1.0 Some of the features in the apparatus claims 1, 4-11 relate to a method of using the apparatus rather than clearly defining the apparatus in terms of its technical features. The intended limitations are therefore not clear from this claim, contrary to the requirements of Article 6 PCT.

Bremen, 7 July 2005

Our Ref.: MA 7798-01WO JOE/ac

Applicant: MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

Serial Number: PCT/JP2004/013281

New claims (amended under Art. 34 PCT)  
(clear copy)

1. An apparatus for removing semiconductor chip (5) in which one out of a plurality of semiconductor chips (1) formed from a diced semiconductor wafer (2) is removed from a pressure-sensitive adhesive sheet (3) which holds the semiconductor chips by adhering thereto, so that the semiconductor chip is extracted from the adhesive sheet, comprising:

a removing member (21) having a plurality of protruding portions (30) for coming into contact with a bottom surface of the semiconductor chip through the adhesive sheet and a plurality of suction hole portions (32) formed in recess portions (31) in between the respective protruding portions for sucking the adhesive sheet so as to partially remove the adhesive sheet from the semiconductor chip at suction positions, the protruding portions and the suction hole portions are formed on a first contact surface (21a) for the chip through the adhesive sheet; and

a holding portion (22) for sucking and holding the adhesive sheet around the removing member by bringing a second contact (22a) surface thereof into contact with the adhesive sheet; and

a removing member moving device (24) for moving the removing member along the bottom surface of the semiconductor chip to the holding portion so as to vary each of contact positions of the adhesive sheet with the respective protruding portions of the removing member and each of the suction positions of the adhesive sheet through the respective suction hole portions of the

- 2 -

removing member, in a condition that the first contact surface is located at a almost same height of the second contact surface, wherein

in a state that a bottom surface of the adhesive sheet located around the first contact surface of the removing member is sucked and held by the second surface of the holding portion and the adhesive sheet is sucked through the respective suction hole portions on the first contact surface of the removing member so as to be partially removed, the respective contact positions are moved to the suction positions by moving the removing member by the removing member moving device, so that a region of the partial removal between the bottom surface of the semiconductor chip and the adhesive sheet is made to expand.

2. The apparatus for removing semiconductor chip as defined in Claim 1, wherein the removing member is formed so that an adhesion region (R1) of the semiconductor chip to be removed to the adhesive sheet is disposed in a region of a top surface of the adhesive sheet corresponding to a movement region (R2) of the respective protruding portions of the removing member by the removing member moving device.

3. The apparatus for removing semiconductor chip as defined in Claim 2, wherein the holding portion is formed so that a region of a top surface of the adhesive sheet corresponding to a suction region (R3) by the holding portion is disposed adjacent or close to the adhesion region of the semiconductor chip to be removed.

4. The apparatus for removing semiconductor chip as defined in Claim 1, wherein the respective suction hole portions are formed on bottom sections of the respective recess portions, and

the bottom surfaces of the adhesive sheet disposed in between respective contact positions by the respective protruding portions adjacent to each other are sucked through the respective suction hole portions so as to be brought into contact with or be close to top surfaces of the respective recess portions for the removal.



- 3 -

5. The apparatus for removing semiconductor chip as defined in Claim 1, wherein the semiconductor chip is almost entirely removed from the adhesive sheet by changing an almost entire bonding of the semiconductor chip to the adhesive sheet by adhesion to a partial bonding by suction through the respective suction hole portions, and further moving the removing member by the removing member moving device so as to change positions of the partial bonding and decrease bonding force by the adhesion.
6. The apparatus for removing semiconductor chips as defined in Claim 1, wherein force of the holding portion to suck and hold the pressure-sensitive adhesive sheet is set to be larger than force of the respective suction hole portions to suck the pressure-sensitive adhesive sheet.
7. The apparatus for removing semiconductor chip as defined in Claim 1, wherein a movement range of the respective protruding portions in the removing member is set to be larger than at least a formation interval of the respective protruding portions.
8. The apparatus for removing semiconductor chip as defined in Claim 1, wherein the movement of the removing member by the removing member moving device is a reciprocal movement of the removing member in a specified direction along the bottom surface of the semiconductor chip.
9. The apparatus for removing semiconductor chip as defined in Claim 1, wherein the movement of the removing member by the removing member moving device is a rotating movement of the removing member around a direction almost perpendicular to the bottom surface of the semiconductor chip.
10. The apparatus for removing semiconductor chip as defined in Claim 8, wherein the removing member moving device is operable to move the removing member reciprocally so as to vibrate the removing member.

- 4 -

11. An apparatus for feeding semiconductor chips, comprising:  
the apparatus for removing semiconductor chip (5) as defined in Claim 1;

a wafer holding unit (4) for holding the semiconductor wafer in the state of adhering to the adhesive sheet; and

a removing apparatus moving device (6) for relatively moving the apparatus for removing semiconductor chip along a surface of the semiconductor wafer which is held by the wafer holding unit and aligning one out of the respective semiconductor chips and the removing member; wherein

the semiconductor chips are removed from the adhesive sheet so that the semiconductor chips are fed.

12. A method for removing semiconductor chip in which one out of a plurality of semiconductor chips (1) formed from a diced semiconductor wafer (2) is removed from a pressure-sensitive adhesive sheet (3) which holds the semiconductor chips by adhering thereto, so that the semiconductor chip is extracted from the adhesive sheet, comprising:

bringing a plurality of protruding portions (30) on a first contact surface (21a) of a removing member (21) into contact with a bottom surface of the semiconductor chip through the adhesive sheet at a region (R2) on a bottom surface side of the adhesive sheet while sucking and holding a vicinity of the bottom surface-side region (R2) of the adhesive sheet corresponding to an adhesion region (R1) of the semiconductor chip by a second contact surface (22a) of a holding portion (22) located around the first contact surface;

sucking the adhesive sheet in between the respective protruding portions so as to partially remove the adhesive sheet in the adhesion region from the semiconductor chip at suction positions;

moving respective contact positions with the protruding portions to the suction positions on the bottom surface-side region of the adhesive sheet by moving the removing member along the bottom surface of the semiconductor chip to the holding portion, in a condition that the first contact surface is located at a almost same height of the second contact surface, so that a region of the partial removal in the adhesion region is made to expand.

- 5 -

13. The method for removing semiconductor chip as defined in Claim 12, wherein force to suck and hold the vicinity of the bottom surface-region of the adhesive sheet corresponding to the adhesion region is set to be larger than force to suck the adhesive sheet in between the respective protruding portions.
14. The method for removing semiconductor chip as defined in Claim 12, wherein the movement of the removing member is a reciprocal movement of the removing member in a specified direction along the bottom surface of the semiconductor chip.
15. The method for removing semiconductor chip as defined in Claim 14, wherein an amplitude in the reciprocal movement of the removing member is larger than a formation interval of the respective protruding portions.
16. The method for removing semiconductor chip as defined in Claim 12, wherein the movement of the removing member is a rotating movement of the removing member around a direction almost perpendicular to the bottom surface of the semiconductor chip.
17. The apparatus for removing semiconductor chip as defined in Claim 1, wherein the movement of the removing member by the removing member moving device is a reciprocal movement of the removing member in a specified direction with a specified amplitude along the bottom surface of the semiconductor chip.
18. The method for removing semiconductor chip as defined in Claim 12, wherein the movement of the removing member is a reciprocal movement of the removing member in a specified direction with a specified amplitude along the bottom surface of the semiconductor chip.
19. The apparatus for removing semiconductor chip as defined in Claim 1, further comprising:  
a first suction pressure transmitting pipeline which is connected to the first contact surface of the removing member so as to transmit a suction pressure

- 6 -

for sucking and holding the adhesive sheet, on which a first open/close valve (38) is installed for controlling transmission of the suction pressure,

a second suction pressure transmitting pipeline which is connected to the second contact surface of the holding portion so as to transmit a suction pressure for sucking and holding the adhesive sheet, on which a second open/close valve (39) is installed for controlling transmission of the suction pressure, and

control section (9) which is operable to conduct timing control for moving operation of the removing member by the removing member moving device and suction pressure transmitting operation by controlling the first and second open/close valves individually, wherein

in a state that a bottom surface of the adhesive sheet located around the first contact surface of the removing member is sucked and held by the second surface of the holding portion and the adhesive sheet is sucked through the respective suction hole portions on the first contact surface of the removing member so as to be partially removed by conducting the suction pressure transmitting operation, the respective contact positions are moved to the suction positions by conducting the moving operation of the removing member by the removing member moving device, so that a region of the partial removal between the bottom surface of the semiconductor chip and the adhesive sheet is made to expand.